

Renovations in Occupied Buildings

Identifying the Problems and Measures to be Used to Minimize Impact on Indoor Air Quality In Buildings

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Renovations in Occupied Buildings

603 CMR 38.00: School Construction

603 CMR 38.03: General Requirements:
Capital Construction

Renovations in Occupied Buildings

603 CMR 38.00(13)

Applicants shall implement containment procedures for dusts, gases, fumes, and other pollutants created during renovations/construction as part of any planned construction, addition to, or renovation of a school if the building is occupied by students, teachers or school department staff while such renovation and construction is occurring. Such containment procedures shall be consistent with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

Renovations in Occupied Buildings

603 CMR 38.00(13) Continued...

All bids received for school construction or renovations shall include the cost of planning and execution of containment of construction/renovation pollutants consistent with the SMACNA guidelines.

Possible Materials Existing in Any Renovated Building

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|--|---|
| <ul style="list-style-type: none"> • lead • asbestos • mercury • polychlorinated biphenyls (PCBs) • pressure treated wood (PTW) • hydrogen sulfide | <ul style="list-style-type: none"> • carbon monoxide • fuel oil • bacteria • fungus from water damaged materials • bird waste • aerosolized dusts/fumes |
|--|---|

Lead

- paint
 - exterior
 - interior
- plumbing fixture
- pipes

Asbestos

- pipe insulation
- floor tile
- window caulking
- ceiling tiles
- science classroom equipment

Mercury

- fluorescent light bulbs
- thermostats
- science classroom/medical equipment
 - thermometers
 - sphygmomanometers

PCBs

- lights ballasts
- electrical transformers
- paints

PTW

- playground equipment
- foundation sills
- decks

Hydrogen sulfide

- plumbing drains

Carbon Monoxide

- construction vehicles
- gasoline-powered saws
- space heaters
- acetylene welding
- boiler operation

Fuel Oil

- storage tanks
- fuel pumps
- emergency generators

Bacteria

- wastewater
 - gram negative bacteria
- operating chilled water systems
 - Legionella

Fungus

- gypsum wallboard
- carpeting
- ceiling tiles
- structural wood
- pipe insulation

Bird waste

- histoplasmosis
- aspergillosis
- psittacosis
- hypersensitivity pneumonitis

Dust

- cement
- sand
- dirt
- miscellaneous

Constituents of Building Materials

Type of Material	Chemical Constituents
Carpet Backings	1. styrene butyldiene latex backing 2. 4-phenylcyclohexane 3. polypropylene 4. polyurethane 5. jute
Carpet Adhesive	1. water 2. toluene 3. xylene 4. white spirits
Carpet Adhesive	1. neoprene polychloroprene

Constituents of Building Materials

Type of Material	Chemical Constituents
Gypsum wallboard	1. compressed gypsum 2. paper 3. glue
Paint Trim paint, exterior oil-based	1. titanium dioxide 2. titanium calcium 3. zinc oxide 4. linseed oil 5. alkyd resin 6. mineral spirits
Paint Latex house paint	1. water 2. titanium dioxide 3. pigments 4. elastomers 5. ethylene glycol 6. zinc oxide 7. chlorinated phenols

Elements of Practice to Prevent Renovation Impact on Building Occupants

- Communication
- Scheduling
- Use of Barriers
- Exhaust Ventilation
- Protection of Ventilation Related Equipment/Components
- Pollutant Minimization

Communication

- Establish communications between all parties involved with building renovations to prevent potential IAQ problems
- Develop a forum for occupants to express concerns about renovations as well as a program to resolve IAQ issues

Communication

- Develop a notification system for building occupants immediately adjacent to construction activities to report odors and/or dusts problems
- Have these concerns relayed to the contractor in a manner to allow for a timely remediation of the problem

Communication

- Disseminate scheduling itinerary to all affected parties, this can be done in the form of meetings, newsletters or weekly bulletins

Communication

- Obtain Material Safety Data Sheets (MSDS) for all construction materials used during renovations
- Keep MSDS in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act (MGL, 1983)
- Consult MSDS' for any material applied to the effected area during renovation(s)

Scheduling

- When possible, schedule projects which produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy

Exhaust Ventilation

- Provide proper ventilation and allow sufficient curing time as per the manufacturer's instructions concerning these materials
- Use local exhaust ventilation and isolation techniques to control for renovation pollutants

Use of Barriers

- Use local exhaust ventilation and isolation techniques to control for renovation pollutants
- Take precautions to avoid the re-entrainment of these materials into the building's HVAC system

Use of Barriers

- Seal utility holes, spaces in roof decking and temporary walls to eliminate pollutant paths of migration.
- Seal holes created by missing tiles in ceiling temporarily to prevent renovation pollutant migration

Use of Barriers

- Seal hallway doors with polyethylene plastic and duct tape
- Create an air lock of a second door inside the renovation space to reduce migration

Use of Barriers

- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations

**Protection of Ventilation-
Related Equipment/
Components**

- Shut down systems (when possible) during periods of heavy construction/demolition, HVAC system isolation from contaminated environment
- Seal ventilation openings with plastic and utilizing filters with a higher dust spot efficiency where needed

**Protection of Ventilation-
Related Equipment/
Components**

- Assess the design of the HVAC system and schedule for installation to determine how it may be impacted by renovation activities
- Specify HVAC protection requirements pertaining to protection of the return, central filtration and supply components of the ventilation system

Pollutant Minimization

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants
 - This may include constructing barriers, sealing off areas, and temporarily relocating furniture and supplies

Pollutant Minimization

- Use a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping of all surfaces to control for dusts
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- Store to-be-installed HVAC components in areas protected from renovation-generated pollutants

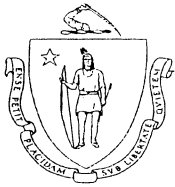
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References

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**PREVENTING
INDOOR AIR QUALITY PROBLEMS
DURING CONSTRUCTION AND RENOVATION**

Renovation can adversely impact Indoor Air Quality in occupied building areas. Symptoms include headache, eye, throat, and respiratory irritation, and an increase in asthma complaints. The following recommendations have been successful in reducing Indoor Air Quality complaints during building renovation activities.

I. COORDINATE CONSTRUCTION SCHEDULE

- Communicate construction phases with building occupants, visitors (for school construction, teachers, parents and students). EPA's "Tools for Schools" packet includes sample letters.
- Review Material Safety Data Sheets (not just Technical Bulletins) of all construction products for hazardous ingredients and their potential impact on indoor air quality.
- Schedule activities which may generate excessive dust, noise or odors when the building is not occupied. Earmark time for building to be cleaned or ventilated before re-occupied.
- Plan generous drying and off-gassing time for paints, carpets and roofing before occupying.

II. SEPARATE CONSTRUCTION AND OCCUPIED AREAS

- Install permanent barriers to prevent building occupants from entering construction areas.
- Prohibit occupant foot traffic in construction areas. Provide protected walkways if necessary. Prohibit contractor foot traffic in occupied areas.
- Seal off HVAC ventilation supply and return ducts in construction area.

III. PREVENT DUST FROM MIGRATING TO OCCUPIED AREAS

- Seal doors, windows, and other openings between construction areas and occupied areas, particularly classrooms, with an air-tight barrier. Seal both sides (inside the construction area, and inside the classroom) to provide a secondary dust barrier and prevent the doors and windows from being used. (Post alternative emergency exits, if applicable.)
- Construction areas should be under negative pressure in relation to occupied areas.
- Inspect polyethylene barriers daily, replace as necessary.
- Do not transport building materials (sheetrock, insulation) through occupied areas.
- Clean floors, lockers, and tables daily with wet methods (soap and water) or vacuum. Do not dry sweep. Add additional custodial staff if necessary during the construction period.
- Implement extra cleaning steps and dust controls for areas with mold growth, such as bleach, biocides and filtered ventilation. Construction specs should include correction of moisture problem to prevent re-growth of mold.

- Use covered chutes to lower construction debris from upper floors.
- Wet down construction debris and uncovered dirt, as necessary to reduce dust kicked up by wind.

DUST: Jackhammering, Abrasive Blasting

- Schedule high-dust activities when building is not occupied.
- Construct air-tight barriers between construction area and occupied areas. Inspect barriers on the occupant side continually during jackhammering and blasting work for dust emissions.
- Stop construction work if visible dust is observed in adjacent non-construction areas. Improve construction area ventilation and barriers before work resumes.
- Provide ventilation inside work area to pull dust away from workers and occupied areas (similar to asbestos negative pressure ventilation).
- Do not clean work areas with compressed air.
- Check and clean adjacent occupied areas following barrier removal before re-occupying.

IV. PREVENT EXPOSURE TO HAZARDOUS CHEMICALS IN CONSTRUCTION PRODUCTS

- Obtain manufacturer's Material Safety Data Sheets (MSDS) for all products used during the project (obtain MSDS in addition to Technical Bulletins). Review for hazardous ingredients, particularly:
Formaldehyde: Can trigger asthma, eye, throat and skin irritation.
Isocyanates : Can cause asthma and allergic reactions at very low concentrations.
- Avoid **Carbon Monoxide** problems from propane heaters, forklifts, truck exhaust. Reduce carbon monoxide emissions through frequent equipment maintenance, and ventilation.
- Plywood, particleboard, carpets - Specify the purchase of low emission products (avoid products which use urea-formaldehyde resins).

ISOCYANATE PRODUCTS - Paints and Roofing Materials

- All two-part epoxy paints and sealants should be suspected of containing isocyanates. Review MSDS for determination. Isocyanates require extra precautions for workers and occupants.
- Substitute a non-isocyanate product if possible.
- Do not apply isocyanate products while any area of the building is occupied.
- Confirm there is adequate ventilation and proper respiratory protection for workers in work area.
- Seal HVAC supply and return ventilation ducts inside construction area to prevent vapor migration to other areas. Seal rooftop air intakes for all building areas during roof work.
- Apply products within weather conditions specified by manufacturer. Incorrect temperature and humidity prevents effective curing rates and can postpone timely re-occupancy of the building.
- After application of an isocyanate product, plan for generous curing and drying times before any area of the building is re-occupied (not just the painted area).

V. ASBESTOS AND LEAD

- ☐ Inspect areas prior to work for Asbestos and Lead containing materials.
- ☐ Paint on interior and exterior surfaces (walls, windows, woodwork, shingles) should be tested for lead, or presumed to contain lead. Lead dust can be generated when painted surfaces are disturbed by chipping, sanding, or removal of woodwork.
- ☐ Asbestos and Lead which could become damaged should be removed properly before renovation. Asbestos removal requires a licensed Asbestos Abatement Contractor. A licensed Lead Abatement Contractor is required for residences, and is recommended for schools, offices and other facilities to ensure workers and building occupants are protected.
- ☐ Air samples should be collected during and after asbestos and lead removal to ensure that dusts are not migrating to other areas. Surface wipe samples should be collected after lead removal.

VI. RESPONDING TO ACUTE EPISODES OF INDOOR AIR QUALITY COMPLAINTS

- ☐ Unexpected releases of dust or odors into non-construction areas could cause an episode of headache, nausea, or respiratory complaints among building occupants. The following action is recommended:
- ☐ Stop construction work. Determine source of release.
- ☐ Remove other occupants from area of building where symptoms occurred.
- ☐ Implement engineering or administrative corrections, such as:
 - Improve construction area ventilation.
 - Ventilate non-construction areas with fresh air.
 - Repair and replace air-tight barriers between construction and non-construction areas.
 - Clean non-construction areas with wet mopping and HEPA vacuum methods.
 - Move the offending activity to a non-occupied time period.
- ☐ Perform air monitoring for chemical contaminants if applicable. Do not occupy affected areas until testing confirms that chemical or dust concentrations are not hazardous.

VII. BUILDING VENTILATION

- ☐ Many indoor air quality problems result from an inadequate supply of fresh air to occupied areas.
- ☐ Locate outside air intakes and ensure louvers are operating, open and unobstructed. Air intakes should not be located next to, or downwind from: exhaust vents; loading docks; rest room exhaust vents; or cooling towers.
- ☐ Check all thermostat controls. Fans should be set on the "ON" setting and not to "AUTO." The "Auto" setting only provides ventilation when the thermostat demands heating or cooling. The "On" setting will provide a constant supply of fresh air.
- ☐ Filters on ventilation units should be replaced with a regular frequency (often seasonally).
- ☐ Building heating and ventilation system should be on a preventative maintenance schedule.

